A Synopsis of the Thesis entitled

"Studies on Environmental Impact of Municipal Solid Waste Leachate at Disposal Site of Latur City (MS), India"

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Introduction:

Solid waste is the term used to describe non-liquid waste materials arising from domestic, trade, commercial, agricultural, industrial activities and from public services (Palnitkar, 2002). The 'Municipal Solid Waste' includes commercial and residential wastes generated in municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes. (MoEF, 2000).

Municipal solid waste management is an obligatory function of Municipal Corporations, Municipalities and other local village administrative bodies in India. It involves activities associated with generation, storage, collection, transfer and transport, processing and disposal of solid waste. But, in most cities, the MSWM system comprises only four activities, i.e., waste generation, collection, transportation, and disposal. The management of MSW requires specific infrastructure, maintenance and up gradation of all related activities. This becomes increasingly expensive and complex due to the continuous and unplanned growth of urban centers. The difficulties in providing the desired level of public service in the urban centers are often attributed to the poor financial status of the managing municipal corporations.

The organic component of these wastes consists mainly of materials such as food wastes, paper, cardboard, textile, plastics, rubber, leather and yard waste. The inorganic component consists of items such as glass bottles, tin cans, aluminum, other metal, batteries oil and paints. Whereas commercial wastes are rich in paper, cardboard, plastics, glass, wood and other packaging materials. The institutional wastes include waste generated from schools, colleges, government and private institutions, prisons etc. this category of waste is similar to residential and commercial waste but may also contains hazardous waste e.g. chemicals from laboratories.

The quantity of MSW generated depends on a number of factors such as food habits, standard of living, degree of commercial activities and seasons. Data on quantity variation and generation are useful in planning for collection and disposal systems.

The rapid industrial development may play an important role in the process of urban development. The urban development directly and indirectly responsible for the increasing the quantity of solid waste in the city area. The proper management of the solid waste may reduce the environmental problems, generally resulted due to improper

disposal of waste. The health hazards associated with the disposal of solid waste may also reduce by employing the scientific management system for the solid waste.

Solid waste of each municipal corporation is diversified in nature and highly dependent on the type of area from where it has collected. The quantity and characteristics of solid waste vary from place to place; factors that influence the quantity and composition are the average income level, the sources, the population, social behavior, climate, industrial production and the market for waste materials. Simultaneously the nature of environmental problems and health hazards also varied from place to place to along with the nature of solid waste.

The inadequate methods adopted for disposal of solid waste are responsible for the serious health concern. The poorly maintained landfill sites are prone to groundwater contamination because of leachate production. Open dumping of garbage facilitates the breeding for disease vectors such as flies, mosquitoes, cockroaches, rats, and other pests.

Due to the industrial development the annual income of the population residing in city has been increased, which may result into the increase in living standard of the society, which results into the process of more materialistic and consumerism. The rapidly expanding urbanization has direct relation with the waste generation rate. The problem of management of municipal solid waste generate in urban centers are a concern for the Urban Local Bodies (ULB) and the city dwellers.

Review of Literature

With increasing urbanization and changing life styles, Indian cities now generate eight times more municipal solid waste than they generated in 1947. Presently, about 90 million tons of solid waste are generated annually as byproducts of industrial, mining, municipal, agricultural and other processes. As per the 2001 census the population of urban India was 285 million which produces approximately 1, 20,000 tons of solid waste every day. The most exhibited consequence of the population explosion is seen in the form of increase in solid waste quantity and the problems associated with disposal.

In India, the per capita waste generation in urban areas ranges from 0.2 to 0.6 kg, leading to a generation of 38 million ton of municipal solid waste (MSW) per year The Ministry of Urban Development (MoUD) in India estimates that, the rate of collection is about 75 % (ton of MSW collected by municipal corporation/ton of MSW generated by

city) for urban areas. While, The Energy and Research Institute (TERI) estimates the rate of collection is about 72.5% (CPCB, 2000).

Management of solid waste is become a major challenge for the administrators, engineers and planners. Huge volume of generated solid wastes is needed to be collected, transported and finally disposed off scientifically. Unfortunately, in many developing countries, the system for managing wastes is primitive and cannot cope with huge volumes of waste being generated. In developing countries, it is common to find large heaps of garbage festering all over the city. The problem gets further complicated due to the obsolete techniques employed for waste management (Tyagi, 2008).

Scientific disposal of waste is the most neglected area of SWM services. Almost all municipal authorities deposit solid waste at a dump-yard situated within or outside the city haphazardly and do not bother to spread and cover the waste with inert material. These sites emanate foul smell and become breeding grounds for flies, rodent, and pests. Liquid seeping through the rotting organic waste called leachate, which may pollute underground water and poses a serious threat to health and environment.

Leachate is the black, foul-smelling toxic liquid emanating from rotting garbage at landfills, which not just has fungus and bacteria in it but harmful chemicals as well. It gets accumulated at the bottom of the landfill and percolates down through the soil contaminating the groundwater. It contaminates surface water as well. Such contamination of groundwater resources poses a substantial risk to local resource users and to the natural environment.

Leachate generation is a major problem for municipal solid waste (MSW) landfills. Leachate treatment options include recycling, on-site treatment, discharge to a municipal sewage treatment plant, or a combination of these approaches.

When water percolates through waste, it promotes and assists the process of decomposition by bacteria and fungi. These processes in turn release by-products of decomposition and rapidly use up any available oxygen, creating an anoxic environment. In actively decomposing waste, the temperature rises and the pH falls rapidly with the result that many metal ions that are relatively insoluble at neutral pH become dissolved in the developing leachate.

The insanitary methods adopted for disposal of solid wastes is, therefore, a serious health concern. The poorly maintained landfill sites are prone to groundwater contamination because of leachate production. Open dumping of garbage facilitates the

breeding for disease vectors such as flies, mosquitoes, cockroaches, rats, and other pests (CPCB, 2000).

Leachate quality may vary from time to time and site to site due to variables such as waste composition, temperature, moisture content, climatic changes (Alkalay *et al.,* 1998). Various methods to evaluate the leachate quality variations were reported (El-Fadel *et al*., 2002).

A technique developed by Kumar and Alappat (2003), quantifies the landfill leachate pollution in terms of Leachate Pollution Index (LPI), a value higher than 7.5 indicates a polluting leachate. LPI is useful to monitor the leachate trends over the life time of the site and thus useful to take necessary decisions as deemed fit. Literature on MSW dumpsite leachates throws light on the pollution potential of leachate and the need for the remedial measures to protect the environment from leachate pollution (Jorstad *et al*., 2004).

Knowledge of leachate quality will be useful in planning and providing remedial measures such as proper liner system and leachate treatment. Periodic monitoring of leachate quality was carried out at two large dumpsites in Chennai, India and four smaller dumpsites from Sri Lanka. The leachates were monitored for changes in pH, EC, TDS, COD, BOD, DOC, Amm-Nitrogen, Chloride and heavy metals. Leachate Pollution Index (LPI) for PDG and KDG leachate was 12 and 10, respectively. This showed that PDG leachate is more polluted than KDG leachate. Further, both leachates showed higher LPI value than that of 7.4 obtained for the treated leachate that can be disposed into inland surface water as per Indian standards. LPI for BU, SE, MA and KE dumpsites was 13, 18, 21 and 23, respectively indicating that the smaller dumpsites are posing higher pollution potential in terms of leachate characteristics. The paper discusses the leachate quality variations and LPI values in monsoon and dry seasons as well as the site-specific variations (Esakku, 2007).

The impact of leachates on groundwater and other water resources has attracted a lot of attention worldwide because of its overwhelming environmental significance. Leachate migrations from waste sites or landfills and the release of pollutants from sediment (under certain conditions) pose a high risk to groundwater resource if not adequately managed. Their impact on groundwater continues to raise concern and have become the subject of recent and past investigations (Ahmed and Sulaiman, 2001).

Solid waste management is among the basic essential services provided by municipal authorities in the country to keep cities clean. Primary sources of solid waste are local households, commercial establishments, hospitals, hotels, restaurants, and markets. Local Bodies are responsible for collection, storage, segregation, transportation and disposal of all solid waste generated in the city.

Hence, the proposed work will significant to get the information about the existing status of municipal solid waste management of study area; identification of the environmental impacts of leachate generated at Municipal solid waste disposal site and to recommend the appropriate waste disposal techniques.

Study Area:

Latur is a city in the Indian state of Maharashtra, and is one of the largest cities of the Marathwada region. It is the administrative headquarters of Latur district . The city's quality of education attracts students from all over Maharashtra. Latur is situated 636 meters above mean sea level, on the Balaghat plateau, near the Maharashtra–Karnataka state boundary. The city receives the rainfall occurs in the monsoon season from June to September. Average annual rainfall is 725 millimeters (28.5 in). As per the 2011 census population of Latur city is 382754. The Latur city generates maximum quantity i.e., 151 MTD. The waste dumping site for the city is Warvatni. The issue of solid waste management in Latur city brought a kind attention of National Green Tribunal in 2019 to direct the orders to preparation of plan for effective solid waste management.

During the proposed investigation existing status of municipal solid waste management of the study area will be carried out. The classification and percent composition of municipal solid waste collected at disposal site; the physico-chemical characteristics of leachate and its impact of on physico-chemical characteristics of groundwater in vicinity of waste disposal site will be carried out.

Objectives of the work

1. To study the existing status of municipal solid waste management of Latur city.
2. To study the environmental problems associated with solid waste
3. To study the classification and percent composition of municipal solid waste collected at disposal site.

4. To study the physico-chemical characteristics of municipal solid waste leachate generated at waste disposal site.
5. To study the impact of leachate on physico-chemical characteristics of groundwater in vicinity of waste disposal site.
6. To assess the Leachate pollution indices.

Methodology

The proposed objectives will be worked out by using the widely accepted methods. The baseline data regarding the existing status of municipal solid waste management of Latur city will be collected by questionnaire method and frequent visits to the concerned department of Municipal Corporation.

The classification and percent composition study will be carried out by using the quartering method followed by weighing the segregated components (CPHERI,1974). The quality of leachate and its impact on groundwater in terms of its of physical and chemical characteristics will be studied by using widely accepted methodology (APHA ,1998; Maiti, 2004).

Importance of Study / Society Applications:

The rapid industrial development may play an important role in the process of urban development. The urban development directly and indirectly responsible for the increasing the quantity of solid waste in the city area. The proper management of the solid waste may reduce the environmental problems, generally resulted due to improper disposal of waste. The health hazards associated with the disposal of solid waste may also reduce by employing the scientific disposal methods for the municipal solid waste.

International Status

Many cities in developing Asian countries face serious problems in managing solid wastes. Information on the characteristics of solid waste is essential for planning disposal methods for solid wastes. Reliable data on solid waste compositions are difficult to obtain, and even if available, they are often not updated (Azni *et al.*, 2004).

Ikem (2002) studied the evaluation of groundwater quality characteristics near two waste sites in Ibadan and Lagos, Nigeria total of 51 groundwater samples (30 wells in Ibadan and 21 wells in Lagos) were monitored seasonally for two years in Ibadan and a year in Lagos. Results from this study revealed that some of the groundwater quality

constituents determined exceeded the World Health Organization (WHO) standards for drinking water irrespective of source of pollution. Some of the groundwater samples were poor in quality in terms of pH, conductivity, total dissolved solids, chloride, nitrate, ammonia, COD, Al, Cd, Cr, Fe, Pb, Ni and total coliforms recorded.

National Status

In metropolitan cities, open, uncontrolled and poorly managed dumping is commonly practiced, giving rise to serious environmental degradation. More than 90% of MSW in cities and towns are directly disposed of on land in an unsatisfactory manner.

The dumping fields are mostly open grounds without any seepage proof lining for leachate collection involving huge risk of groundwater contamination. In fact, analysis of physiochemical characteristics of groundwater samples from tube wells and bore wells near dumping sites in some major Indian cities have shown substantial concentration of heavy metals and chemicals in excess of permissible limits (Kumar *et al*., 2009).

Vasanthi *et al*., (2008) studied the quality of ground water around a municipal solid waste disposal site in Chennai. Chemical analyses were carried out on water samples collected at various radial distances from the boundary of the dumping yard, at intervals of 3 months and for a period of 3 years. The study has revealed that the ground water quality does not conform to the drinking water quality standards as per Bureau of Indian Standards.

Significance of the study

The proposed work will significant for the planers and policy makers of the solid waste management division of the concerned municipal corporation to prepare a comprehensive plan for the effective and scientific disposal of generated waste.

Plan of proposed work:

First Year: Literature survey and collection of baseline data regarding the existing status of the municipal solid waste management of the study area will be carried out.

Second Year: Study of classification and percent composition of waste; physico-chemical characteristics of leachate and its impact on groundwater quality in vicinity of waste disposal site will be carried out.

Third Year: Study of leachate pollution index; interpretation of results; thesis writing and submission.

Organization of work

The work will be divided into five Chapters

Chapter – I: Introduction-

The introduction of thesis will be summarized in this topic and its national and international status will be given in it, along with why problem has been selected.

Chapter – II: Study area-

This topic will contain the details of study area where work is to be carried out.

Chapter – III: Materials and methods-

The details of materials and methods used for work will be summarized in this topic.

Chapter - IV: Results and Discussion

The results of work will be discussed with appropriate references by giving suitable reasoning. The summary and conclusion will be included in this topic at last with recommendations.

Chapter – V: References

The cited references in introduction, materials and methods, and discussion will be summarized in this topic.

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